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TREATMENTS FOR CONTROL OF BARLEY YELLOW DWARF VIRUS IN WHEAT

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Introduction

Barley yellow dwarf virus (BYDV) can be a significant problem in early-seeded winter wheat in the Columbia Basin. The level of disease varies from year to year depending on environmental conditions that impact aphid populations, the insect vectors that transmit this disease during feeding. Warm fall temperatures in some years allow aphid populations to remain long enough to allow feeding on newly emerged wheat, thus transferring the virus. This variability in levels of infection from year to year makes it challenging for growers to control BYDV. Current low commodity prices and slim profit margins demand a management strategy that allows the grower the flexibility to control aphids, but only when necessary.

BYDV is distributed worldwide. It is the most economically important disease of barley and oats in North America, but it also attacks wheat. BYDV can be transmitted by at least 23 species of aphid and infects almost 100 species of annual and perennial grasses, including barley, corn, oats, rye and wheat (Watkins and Lane, 1989). BYDV includes five strains based primarily on the specific aphid species able to transmit the particular strain. The most important strain in the Pacific Northwest is designated PVA. The most important aphid vectors in wheat are the oat bird-cherry aphid (*Rhopalosiphum padi*), the English grain aphid (*Sitobion avenae*), and the greenbug (*Schizaphis graminum*) (Cook and Veseth, 1991).

Symptoms typical of BYDV disease on small grains are often overlooked and may be confused with other causes, e.g. mineral deficiencies, bacterial toxins, leaf breakage, low temperatures, root and crown rots, and others. Generally symptoms are most pronounced in the spring, during rapid growth and heading, when infected plants appear stunted and sometimes off-colored (yellow). Often a greater number of severely infected plants appear near field edges on the windward side. A random distribution of infected plants can also be found throughout the field. In fields low to moderately infected, healthy plants will be intermixed with infected plants. Definitive diagnosis requires serologic tests such as enzyme-linked immunosorbent assay (ELISA) and/or recovery and transmission of the virus by aphids (Anonymous, 1989).

Early planted winter wheat is highly susceptible to infection. Young plants are attractive to aphids. Historically, winter wheat plantings have been delayed until aphid populations have declined to minimize the impacts of BYDV (Watkins and Lane 1989). Growers, however, do not always have the option of later planting, particularly when following early harvested crops such as potatoes or where large acreages must be planted. In these situations growers are forced to plant early to increase protection from erosion and/or must plant early before fall temperatures become too low. The purpose of this study was to determine the most efficient and economic way to control BYDV in early planted winter wheat in the Columbia Basin.

Materials and Methods

The experiment was conducted on an irrigated circle at Madison Farms, Echo,

Oregon in 1999 (Morrow Co.). Soil was Quincy loamy fine sand. Winter wheat (Stephens) was sown at 60 lbs/ac on September 5, 1999. All seed was treated with Dividend/Apron® (Syngenta) (1 oz/ cwt). Plots (36 ft x 2,620 ft) were arranged in a randomized complete block design with three replications of each treatment. A buffer zone 108 ft wide was maintained on both sides of the aerial-treated plots. Plots were seeded using the cooperator's Concorde air drill. Seeding (row spacing), harvest, and production practices were typical for the location and were performed by the cooperator.

Experimental Treatments

Table 1. lists the treatments used. Treatments were Gaucho® and Adage® seed treatments, Di-Syston® applied in-furrow at planting, fall applied Warrior® (12 October, 1999) and an untreated check.

Table 1. Treatments compared to control Barley Yellow Dwarf Virus

Product	(Manufacturer)	Treatment
Gaucho®	480 FL (Gustafson)	1.5 fl. oz/cwt
Gaucho®	480 FL(Gustafson)	2.0 fl. oz/cwt
Adage®	(Syngenta)	1.3 fl. oz/cwt
Di-Syston®	(Bayer)	6/7 lb/ac
Warrior®	(Syngenta)	3.84 fl. oz/cwt

Plant Sampling

Plant stems and flag leaves were randomly collected from each plot on June 2, 2000. Serological testing (ELISA) confirmed the presence of BYDV.

Results and Discussion

Treatment difference became evident in the spring after wheat plants began to grow, particularly at time of heading. Three healthy strips, visible from both the ground and air, demarked where the aerial application of Warrior® occurred.

Statistical analysis confirmed a significant difference in yield (at a P=0.07 confidence level) between Warrior® and the untreated control (106 versus 86 bu/ac, respectively). There were no statistically significant differences in yields between the untreated control and any of the other treatments. Estimated costs of the treatments are listed in Table 2.

Table 2. Trial results – yields and treat-ment costs

Treatments	Rate	Yield	Cost $/ac
Control		86	0.00
Di-Syston®	6.7 lb/ac	91	13.07
Gaucho®	2.0 oz/cwt	95	9.11
Gaucho®	1.5 oz/cwt	84	6.83
Adage®	1.3 oz/cwt	92	6.98
Warrior®	3.84 oz/ac	106	16.64

Estimated product cost for Warrior® was $11.64/acre, and application cost was $5.00/acre. A yield increase of 20 bushels/acre for the Warrior® treatment provided gross additional revenues of $55.00 (at $2.75/bu). Warrior® application showed a net return of $38.36/acre.

Summary and Conclusions

The use of a topical insecticide, only when aphid pressure warrants use, is a significant economic option for winter wheat growers. Not only did the use of Warrior® in this case provide an option for growers to control aphids, once aphids were a risk to the crop, but this material apparently provided

better and/or longer lasting control of the vectors of BYDV. The analysis suggests that a Warrior® application would be economically viable when planting winter wheat prior to or near September 5, particularly when aphids are present at wheat emergence and mild weather conditions favor aphid survival into the fall, which can lead to BYDV infection.

Acknowledgements

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References

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